

Participation in a Multiple Screening Clinic With Five-Year Followup

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SCREENING TESTS are procedures that sort out persons who may have abnormalities from those who probably have none (1). Multiple screening is the simultaneous use of two or more screening tests. Its major aim is the early detection and treatment of disease. However, multiple screening may have no measurable effect on the screened population if most participants are free from undetected illness or are disinterested in seeking care for newly discovered disease, or if the disease found is one for which treatment is not beneficial. It is important to the success of screening, therefore, to know as much as possible about those who participate and those who decline to participate, and, if necessary, to develop better methods for attracting groups who will benefit most from screening.

Participation in some types of health programs has already been well studied. However, there is reason to believe that patterns of participation will not be the same for all preventive programs. Programs aimed at different diseases or involving different procedures may appeal to one population more than to another. For example, tuberculosis and poliomyelitis may be perceived in different ways by whites and nonwhites. Participation in programs aimed at eradicating each disease has

differed with race, nonwhites being the more attracted to the chest X-ray programs. Participants in multiple screening, aimed at a variety of diseases, may differ from those attracted by single screening programs. Finally, even though it detects similar groups of diseases, multiple screening may attract different participants from those who are attracted by physical examination programs. Multiple screening is faster than physical examination and involves no undressing and no personal contact with a physician.

The purpose of this study is to contrast the characteristics of participants and nonparticipants in a multiple screening clinic, to describe their response to a questionnaire mailed in 1960, 5 years after screening was completed, and to compare change of residence figures. The study will also present mortality trends, causes of death, and morbidity figures for each group for the 5 years following screening.

Method of Study

To determine the prevalence of illness in Baltimore, the Commission on Chronic Illness, a national voluntary organization, studied a 1-in-80 sample of households, excluding institutionalized persons. This sample comprised 11,574 individuals. Interview data were obtained for 98 percent of these households. This study was begun in 1949 and completed in 1956.

Of this group, 6,967 individuals, aged 17 years and over, were reported free from serious health problems. The commission invited these persons to participate in a multiple screening clinic to be held October through December 1954. Efforts to persuade them to attend the

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clinic included personal letters, telephone calls, home visits, and newspaper, radio, and television publicity. As a result 2,023 persons participated in the screening program (2). This was only 29 percent of those invited.

In 1960 the Johns Hopkins University School of Hygiene and Public Health obtained from the original records of the commission the sex, race, and age in 1954 of participants and of nonparticipants in the screening program. These records also provided the names, addresses, and telephone numbers in 1954 of all screenees. The same information was obtained on a one-in-five random sample of the nonparticipants. This sample corresponded closely in age, sex, and race distribution with all nonparticipants.

Four steps were taken to obtain more recent information on these individuals:

Step 1. We searched the latest city and suburban directories for Baltimore. These directories listed the names and addresses of residents for 1957 and 1958, respectively. We also searched the city and suburban telephone directories for 1959.

Step 2. We mailed a mimeographed letter to both screenees and nonparticipants, using the 1954 address when no new address was obtained in step 1. This letter reminded each individual of the screening clinic and asked his cooperation in returning a structured questionnaire composed of six items. A stamped addressed envelope was enclosed with the questionnaire. The letter and questionnaire differed in small

details for screenees and for nonparticipants. To complete the questionnaire, each individual filled in his name, address, and telephone number.

Step 3. Persons who did not return the questionnaire within 2 months were contacted by telephone whenever possible. Thus, we were able to complete the majority of the questionnaires. The respondent was required to be the study member or a close relative.

Step 4. In the 1955-59 death certificate files for Baltimore and for the State of Maryland we searched for the names of all persons who had not been contacted previously. Deaths reported in returned questionnaires were also confirmed from these files.

Age, Sex, Race, and Socioeconomic Status

Table 1 shows that participation rates in the 1954 screening clinic were greatest in persons between 25 and 54 years of age. There was no consistent difference in attendance between white men and white women. In nonwhites below 65 years of age, however, participation rates were higher for women than for men.

Between the ages of 25 and 74, attendance was greater for whites than for nonwhites. In whites, the highest participation rate occurred between 35 and 44 years; above and below this range rates fell steadily. In nonwhites, the participation rate was fairly constant up to 54 years, and fell steadily above this age.

Screenees and nonparticipants thus differed

Table 1. Percentage of number invited attending screening clinic, by age, race, and sex

Age (years)	Both races (N=6,967) ¹	White			Nonwhite		
		Total (N=5,174)	Men (N=2,393)	Women (N=2,781)	Total (N=1,752)	Men (N=815)	Women (N=937)
All ages.....	29.1	30.2	30.7	29.8	24.5	21.6	26.9
17-24.....	21.7	20.4	21.8	19.5	25.1	22.4	26.9
25-34.....	30.8	33.2	29.2	36.9	24.3	24.2	24.4
35-44.....	35.0	38.7	40.3	37.1	24.2	20.8	27.4
45-54.....	29.9	30.7	29.6	31.9	25.4	19.9	31.4
55-64.....	27.6	28.1	31.7	25.2	23.9	18.1	30.3
65-74.....	23.5	23.2	22.6	23.7	21.2	21.6	20.9
75 and over.....	12.2	10.8	14.8	8.7	16.7	30.0	7.1

¹ Includes 41 persons of unknown age, sex, or race.

NOTE: N—number invited.

Table 2. Percentage distribution of 2,023 screenees and 4,944 nonparticipants, by age, sex, and race, 1954

Age, sex, and race	Screenees	Nonparticipants ¹
Age (years):		
17-24-----	11.0	16.1
25-34-----	25.0	22.9
35-44-----	27.5	20.9
45-54-----	18.5	17.7
55-64-----	11.5	12.3
65 and over-----	6.5	10.3
Sex:		
Male-----	45.6	46.4
Female-----	54.4	53.6
Race:		
White-----	77.6	73.2
Nonwhite-----	22.4	26.8

¹ Excludes those of unknown age.

in distribution by age and race, and only slightly by sex (table 2). The screenees included more persons between 25 and 54 years than did nonparticipants and fewer persons in the younger and older ages. The nonparticipants included the greater percentage of nonwhites.

Not shown in the tables is the fact that 12 percent of screenees and 27 percent of nonparticipants had no telephone, either in 1954 or 1959. This finding probably indicates the higher socioeconomic status of screenees.

Change of Residence

Our own address information was out of date and the post office redirected or returned more than 1,000 letters. Using the 1954 information

modified by corrections obtained from the post office, returned questionnaires, and death certificate files, we placed each individual in one of four classes: (a) at same address as 1954; (b) moved, 1959 address known; (c) moved, 1959 address unknown; or (d) known dead. Table 3 summarizes these findings, and gives the definitions used for placing individuals in each class.

More screenees than nonparticipants remained at their 1954 addresses, or were at new, known addresses. Many more nonparticipants than screenees had moved to unknown addresses. These were believed to be mainly outside Baltimore; however, some may have moved so frequently within Baltimore that they were not listed in directories or post office files. Although not shown in table 3, for comparable age, sex, and race groups, significantly more nonparticipants than screenees had changed residence.

Questionnaire Return

Questionnaires returned without further contact with the addressee were classified as "spontaneously returned"; those filled in as a result of telephone followup were classified separately.

Table 4 shows the results of this classification. Many more screenees than nonparticipants spontaneously returned the questionnaire. About the same percentage in each group answered the questionnaire on telephone followup. Of those whose 1959 addresses were known, and who therefore were assumed to have received

Table 3. Residential status of screenees and nonparticipants on December 31, 1959

Residential status	Screenees		Nonparticipant sample	
	Number	Rate per 1,000	Number	Rate per 1,000
Total-----	2,023	-----	1,021	-----
Same address as 1954 ¹ -----	934	462	352	345
Moved:				
1959 address known ² -----	768	380	288	282
1959 address unknown ³ -----	229	113	377	330
Known dead-----	92	45	44	43

¹ Questionnaire returned showing new address, or no questionnaire returned, but listed in directory at same address and not known dead.

² Questionnaire returned showing new address, or no questionnaire returned, but listed in directory at new address and not known dead.

³ Questionnaire returned by post office stamped "Moved, no forwarding address," or no questionnaire returned and not listed in directory and not known dead.

the questionnaire, 59 percent of screenees and 27 percent of nonparticipants spontaneously responded. For comparable age, sex, and race groups, significantly more screenees than nonparticipants spontaneously returned the questionnaire. These data are not shown in table 4.

Death Information

The two sources of information on deaths were the returned questionnaires and the Baltimore and Maryland death certificate files. Without routine search of these files we would

Table 4. Questionnaire returns by screenees and by sample of nonparticipants, for total group and for persons whose address was known, 1959

Study group	Number	Percent		
		Returned spontaneously	Completed by telephone	Not returned
Total group:				
Screenees.....	2, 023	51. 9	23. 7	24. 5
Nonparticipant sample.....	1, 021	18. 0	22. 6	59. 4
Known address:				
Screenees.....	1, 794	58. 5	26. 7	14. 8
Nonparticipant sample.....	864	26. 9	33. 8	39. 3

Table 5. Mortality per 1,000 for screenees and nonparticipants, by age, 1955-59

Age (years)	Rate per 1,000			
	Unadjusted		Adjusted for movement from Baltimore ¹	
	Screenees	Non-participants	Screenees	Non-participants
All ages..	45	43	49	53
Under 35.....	5	5	6	7
35-49.....	22	16	23	19
50 and over....	133	119	149	147

¹ Based on assumption that persons not found in the study had moved from Baltimore at a uniform rate during the 5-year period 1955-59.

Table 6. Deaths among screenees and nonparticipants for each year following screening, 1955-59

Period	Number		Percent	
	Screenees	Non-participants	Screenees	Non-participants
1955-59.....	92	44	100. 0	100. 0
1955.....	15	6	16. 3	13. 6
1956.....	21	10	22. 8	22. 7
1957.....	18	8	19. 6	18. 2
1958.....	17	9	18. 5	20. 5
1959.....	21	11	22. 8	25. 0

have missed 25 of the 92 known deaths in screenees and 17 of the 44 known deaths in nonparticipants. This task was therefore an essential step in the study.

Although the deaths are too few to give definitive findings, we have analyzed them further to obtain leads that may be helpful. Table 5 gives 5-year mortality figures for three age groups. In each group death rates for screenees were the same as or higher than death rates for nonparticipants in the 5 years following screening. However, more nonparticipants than screenees are believed to have moved away from Baltimore during this period. When death rates were adjusted for the greater emigration of nonparticipants, age-specific rates were about the same for screenees and nonparticipants.

To compare trends in mortality, table 6 presents the number of deaths and the percentage of all deaths occurring in each of the 5 years following completion of the study. The number of deaths in 1955, the first year after screening, was below average in both groups, followed by high figures for 1956. Both screenees and nonparticipants showed similar trends in deaths during the years 1957-59. If screenees had benefited greatly by their early referral for medical care, their subsequent death trends might well have been lower in the first year or two after screening. There was no evidence of a greater initial lowering of the death rates for screenees than for nonparticipants. We have no explanation for the greater number of deaths in 1956, which was an average year for the general population of Baltimore.

Table 7 shows the causes of death in each group. More deaths in screenees than in nonparticipants were attributed to hypertensive disease, malignant neoplasms, and diseases of the digestive system. More nonparticipants than screenees died from nonhypertensive cardiovascular disease, central nervous system vascular lesions, and accidents. These differences are probably a reflection of the different age and race composition of the two groups and of the higher socioeconomic status of the screenees. The differences are not sufficient to suggest that multiple screening attracted a group with significantly more or significantly less of any particular disease than the nonparticipants.

Medical Care Habits

Persons who returned questionnaires are not likely to be representative of the total group to whom questionnaires were sent. However, when screenee respondents are compared with nonparticipant respondents, differences between the two respondent groups are likely to be in the same direction, though not of the same magnitude, as the differences between all screenees and all nonparticipants. For example, 37 percent of screenees and 31 percent of nonparticipants were aged 35-49 years; 38 percent of screenees and 35 percent of nonparticipants who returned questionnaires were also of this age. Fewer screenees than nonparticipants were 50 years old or older; the same held true for the respondents. Similarly, many more screenees than nonparticipants expressed interest in at-

tending a second clinic; of those answering the questionnaire, 81 percent of screenees and 49 percent of nonparticipants stated that they would attend a second clinic. It therefore seems likely that large differences in medical care habits of screenees and nonparticipants would appear in the groups returning the questionnaire.

The questionnaire included two items asking the frequency of visits to a physician and the number of times the respondent was hospitalized during the period 1955-59. Table 8 presents the results of these questions. For all three age groups, more screenee than nonparticipant respondents visited their physicians twice or more per year. Although consistently suggesting that screenees consulted their physicians more often than nonparticipants, the differences were small. Again, more screenee than nonparticipant respondents were admitted to a hospital, for all reasons including childbirth, at least once during the 5-year period. However, the difference between screenees and nonparticipants for each age group was not consistently in the same direction; nonparticipants under 35 years of age were hospitalized more frequently mainly due to the higher childbirth rate among nonwhites. Considerably more screenees than nonparticipant respondents aged 35-49 years had been hospital inpatients.

Discussion

In this study, more screenees than nonparticipants were between 25 and 54 years old, were

Table 7. Causes of death in screenees and nonparticipants, 1955-59

Cause ¹	Number		Percent	
	Screenees	Nonparticipants	Screenees	Nonparticipants
All causes-----	92	44	100.0	100.0
Hypertensive disease (400-447)-----	13	3	14.1	6.8
Other cardiovascular disease (400-434, 450-468)-----	29	18	31.5	40.9
Malignant neoplasms (140-205)-----	19	5	20.7	11.4
CNS vascular lesions (330-334)-----	5	6	5.4	13.6
Accidents, poisonings, and violence (E-800-E-999)-----	3	6	3.3	13.6
Diseases of digestive system (530-587)-----	7	0	7.6	.0
Other-----	16	6	17.4	13.6

¹ International Statistical Classification numbers are given in parentheses.

Table 8. Frequency of physician visits and hospitalization, screenees and nonparticipants, by age, 1955-59

Age (years)	Number answering questionnaire		Percent visiting physician ¹				Percent hospitalized ²			
			2 or more times		1 time or less		1 or more times		0 times	
	Screenees	Nonparticipants	Screenees	Nonparticipants	Screenees	Nonparticipants	Screenees	Nonparticipants	Screenees	Nonparticipants
All ages...	1, 423	384	47. 1	44. 8	52. 9	55. 2	35. 5	32. 4	64. 5	67. 6
Under 35.....	492	117	39. 8	37. 6	60. 2	62. 4	43. 7	47. 0	56. 3	53. 0
35-49.....	564	139	45. 4	42. 4	54. 6	57. 6	30. 0	20. 0	70. 0	80. 0
50 and over.....	367	128	59. 4	53. 9	40. 6	46. 1	33. 0	32. 5	67. 0	67. 5

¹ Per year.

² Per 5 years.

white, and were probably from a higher socioeconomic group. Participation rates for whites were about the same for each sex; in nonwhites under 65 years, women participated more than men. These findings differ from the findings on participation in a physical examination clinic in Baltimore, held at the same time and as part of the Commission on Chronic Illness study of prevalence of illness (2). In that study, participation in physical examination clinics was greatest in the youngest age groups and decreased with age. Participation rates were higher for males than for females and for nonwhites than for whites, the reverse of the findings in the multiple screening study.

Multiple screening and physical examination clinics comparable to those in Baltimore were held also in Hunterdon County, N.J. (3). As in Baltimore, peak participation in screening occurred in the middle age groups, while peak participation in the physical examination clinics occurred in the youngest group. In both Hunterdon County programs, females participated more than males, disagreeing with the sex findings of the Baltimore physical examination clinic. No race differences were mentioned in Hunterdon County.

Cobb and others (4) found that age and sex had little relation to participation rates in physical examinations carried out to determine the prevalence of arthritis in Pittsburgh, Pa. Unpublished data for the Framingham, Mass., cardiovascular study, in which physical examinations were offered to persons between 30 and

59 years of age in the study sample, showed that participation rates were highest in those below age 45, and fell above this age. In the Tecumseh, Mich., community health study currently in progress, preliminary unpublished figures showed peak participation in persons under 50 years of age, with lower rates in older groups; females participated slightly better than males.

In brief, the data on participation in multiple screening and physical examination programs show no uniform pattern for either program. There are indications, however, that each program may appeal to a different population group.

In our own study, more screenees than nonparticipants had remained at the same address or had moved to known addresses. Screenees were thus more easily reached by mail and telephone and were more stable in their residential habits. In followup studies of other programs for evaluating individual screening tests, screenees may be found relatively easily.

Screenees responded in significantly greater numbers to a mailed questionnaire than did nonparticipants in the program. Having attended the clinic in 1954, screenees would have a clearer picture of multiple screening procedures than nonparticipants and probably had a greater desire to help evaluate the clinic. Nevertheless, the difference in response was sufficiently great to suggest that participants in screening formed a group which was more cooperative in other respects, such as answer-

ing questionnaires, than were nonparticipants. The questionnaire and telephone followup for screenees was sufficiently complete to justify using these methods in future studies of screenees.

In the same age range, death rates were similar for screenees and nonparticipants. This finding differs from that in chest X-ray screening programs (5), which suggested that more nonparticipants than screenees had tuberculosis, with presumably higher death rates in nonparticipants. Moreover, in the Framingham epidemiological study of cardiovascular disease, preliminary figures showed that mortality in nonparticipants was twice as high as in participants (6).

Screenees and nonparticipants showed similar death trends for the 5 years following screening. This finding suggests that few screenee deaths were delayed by early detection of disease. In a paper still in preparation we will show that the Baltimore tests did indeed separate off groups with positive tests, whose subsequent death rates were much higher than the death rates for those with negative tests. The screening clinic may therefore have succeeded in bringing under medical supervision most persons with significant disease. If failure did occur, it may have occurred after screening when prompt medical care was not effective in reducing mortality. Preliminary unpublished figures from the Framingham study have shown that periodic physical examinations did not reduce annual death rates. However, mortality is an insensitive index of the effect of health programs, and participants may have benefited in other ways.

Finally, screenees who returned questionnaires had visited their physicians and were admitted to a hospital slightly more frequently than nonparticipant respondents. Though differences were small, it is probable that all screenees and nonparticipants differed in the same direction.

Summary

This paper has contrasted screenees and nonparticipants in the 1954 multiple screening clinic in Baltimore, conducted by the Commission on Chronic Illness. Screenees included

more persons between 25 and 54 years of age and a higher percentage of whites, and were of a higher socioeconomic group than were nonparticipants. There was no sex difference among white screenees; among nonwhites more women than men participated in the clinic.

Screenees were the more stable in their residential habits. For the years 1955-59, more screenees than nonparticipants remained at the same address or moved to known addresses.

Significantly more screenees than nonparticipants answered a questionnaire mailed in 1960.

Screenees and nonparticipants had similar age-specific death rates and showed similar trends in deaths for each year following screening. The two groups differed in the proportion of deaths from various causes; this mainly reflected their different age, race, and socioeconomic composition.

The death trends provided no evidence that screenees benefited greatly by their early referral for medical care, nor did they suggest that multiple screening attracted a group with significantly more or less of any particular disease than the nonparticipants.

Finally, the questionnaire returns suggested, though not conclusively, that screenees visited their physicians and were admitted to a hospital more frequently than were nonparticipants.

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